



asia

fast, clean, safe
flow chemistry



Asia Pressure Controller Manual

Syrris Ltd

Version: 1.2

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Date: 07/10/2015

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1 Introduction

Thank you for purchasing an Asia Pressure Controller.

These instructions have been carefully prepared to guide the installer and end-user through the installation and use of the Asia Pressure Controller.

Before attempting to use this product, please read this manual thoroughly and follow the instructions carefully. In doing so you will ensure the safety of yourself and that of others around you, and you can look forward to your purchase giving you long and satisfactory service.

Please keep the manual easily accessible and in immediate vicinity of the module. Only suitably qualified and trained personnel should operate this unit.

2 Safety

2.1 Intended use

The Asia Pressure Controller module may only be used to pressurize an Asia flow chemistry system or any third-party flow chemistry system fitted with flow tubing connections compatible with the Asia Pressure Controller.

- Working output pressure range: 1 - 20 bar
- Working flow rate range: 1 - 10,000 µl/min
- Input pressure range: 2-25 bar
- Wetted parts material: Glass and PFA

Non-intended use can result in considerable personal injuries and material damage.

The following must be observed:

- Only trained people may use the module.
- Always use the machine in a perfect working condition.
- Only Syrris trained personnel may install or repair the device.
- Always wear appropriate Personal Protective Equipment when using the device.
- The BPR must not be removed while set at a pressure (the pressure must be set to “OFF”). Failure to do so may result in injury.

2.2 Pressure

The Asia Pressure Controller is intended for use with an external pressurized gas supply.

The input gas supply must be within the 2 - 25 bar range. The gas output range is 1 - 20 bar. Please note that the highest deliverable output pressure is limited by the input gas pressure.

Example: if the pressurized gas input has a 12 bar pressure, pressures on the Asia Pressure Controller will only allow between 1 – 12 bar range. The user will only be able to set-up a pressure on the Asia Pressure Controller in a 1 - 12 bar range.



NOTE: The highest deliverable output pressure is limited by the input gas pressure.



CAUTION: Please follow appropriate safety procedures when connecting and using external pressurised gas supplies.



NOTE: Syrris cannot be required to install the gas supply system for the Pressure Controller.

2.3 Chemicals

The Asia Pressure Controller is intended for use with solvents and reagents. Some reagents and solvents used can pose chemical, biological, radiological or explosive hazards.

Be sure you are aware of the potentially hazardous effects of all substances you work with. Appropriate Personal Protective Equipment is to be worn when using the module. All wetted parts from the Asia Pressure Controller are made from either glass or PFA.



CAUTION: Please check the chemical compatibility of reagents and solvents before use with the Asia Pressure Controller.

Warning and safety information



This equipment should only be used by competent, suitably trained personnel after they have read and understood this manual, and considered any hazard involved.



Protection provided by the equipment may be impaired if installed or operated in a manner other than that specified by the manufacturer.



Place the instruments on a solid horizontal fire proof surface. Ensure the area around the unit is clear to ensure that any ventilation openings are not obstructed.



Adequate protection including appropriate PPE and ventilation must be provided if hazardous chemicals are to be used in

conjunction with this unit. In the case of accidental spillage, carefully wipe with a dry cloth, taking into account the nature of the spilled liquid and the necessary safety precautions.



Comply with all safety and accident prevention regulations applicable to laboratory work.



Under normal usage this device reaches temperature extremes and may therefore cause injury. Exercise caution when touching heater, climate controller and attached components.



Always connect the instruments to an earthed ac power outlet. The operating voltage is indicated on the specification sticker. Non observance of this provision may result in damage to the Asia module or in personal injury or damage to property.



Do not use a replacement mains supply cord that is inadequately rated for this piece of equipment. The ratings for this piece of equipment can be found in section 3.2.



This product does not comply with the ATEX directive and must not be used in explosive atmospheres.



Only use the labelled input bottles supplied with the system. These have been pressure tested and coated. If the bottles are scratched or damaged do not use.



The system may be pressurised up to 25 bar. Always use appropriate personal protective equipment including eye protection.



The automated collectors can move without warning. Do not obstruct the deck area when the collectors are switched on.



Before removing or attaching the BPR ensure the pressure controller is switched off or it is set to 0.

Cleaning



Cleaning should only be performed by personnel trained in such work, and who are aware of the possible dangers involved. Asia (and all the associated hardware) has not been designed for sterilisation or use with an autoclave.

Static discharge



To avoid the build-up of static within the unit, which could provide a source of ignition, the Asia pump is fitted with an earth bonding point (indicated on the rear of the unit). This earth bonding should be checked to ensure that static build-up is not possible as part of a risk assessment.

Maintenance



Maintenance should only be attempted by qualified service personnel or under guidance by Syrris. The Asia system may contain hot components – please allow the unit to cool before performing any maintenance operations. The on/off switch must be switched to OFF and the unit disconnected from both mains and any attached apparatus whenever maintenance is performed. Opening any module may invalidate the warranty.

Returning Equipment

Equipment which has been contaminated with, or exposed to, body fluids, toxic chemicals or any other substance hazardous to health must be decontaminated before it is returned to Syrris or its distributor.

A decontamination certificate is included in this manual.

Environmental Conditions

For indoor use only

Temperature range: 5°C to 40°C

Humidity: Maximum relative humidity of 80%

Waste Electrical and Electronic Equipment (WEEE) statement



Syrris is compliant with the EU directive on waste electrical and electronic equipment (WEEE) please refer to www.syrris.com for directions and information on end-of-life policy.

3 Overview of the Asia Pressure Controller

The Asia Pressure Controller pressurizes a flow chemistry system and is normally located at the end of the flow system, just before the collection point. By pressurizing the flow chemistry system, the Asia Pressure Controller enables reactions to be heated up to 150°C over the atmospheric boiling point of solvents, therefore increasing the reaction rates by over 1000 times.

The Pressure Controller consists of a Back-Pressure Regulator (BPR) and an automated gas pressure control system.

The pressure delivered by the Pressure Controller can be set to any value between 1 and 20 bar (at intervals of 1 bar) using the control knob on the front panel or the Asia Manager PC software.

3.1 Module Overview

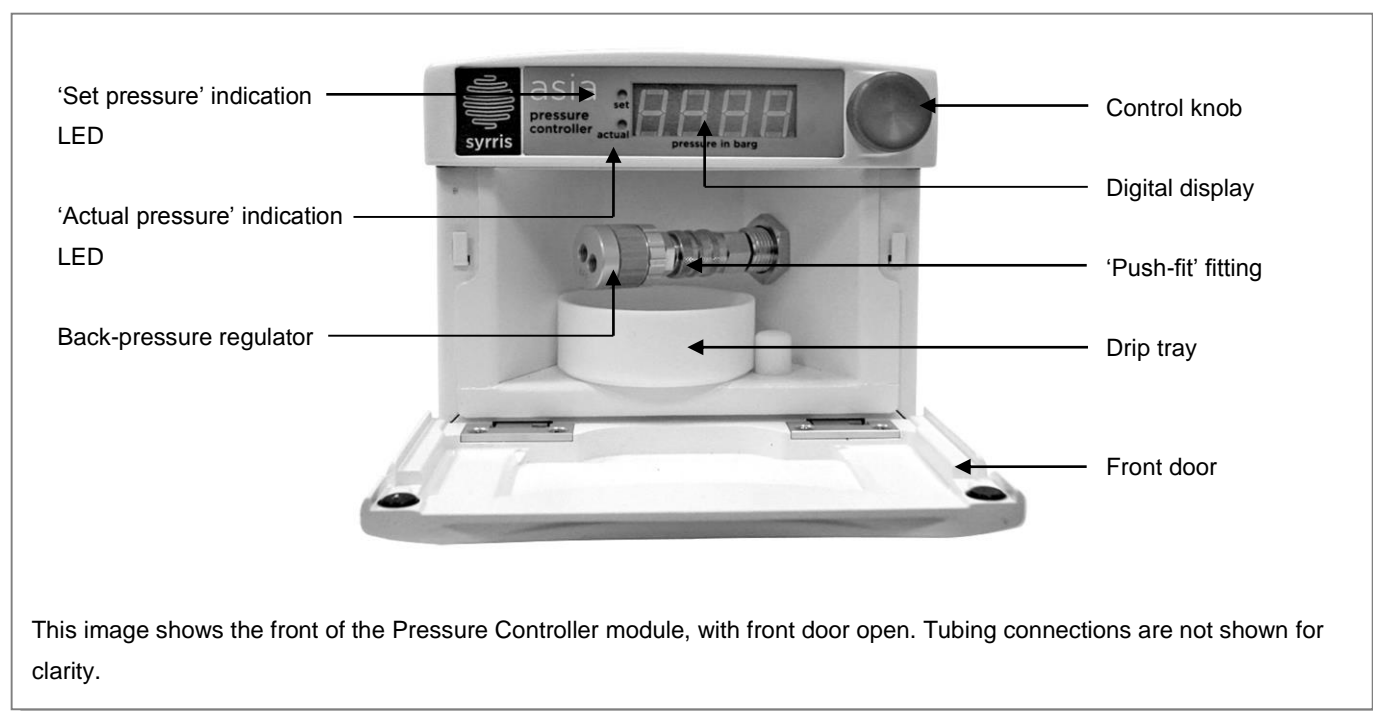
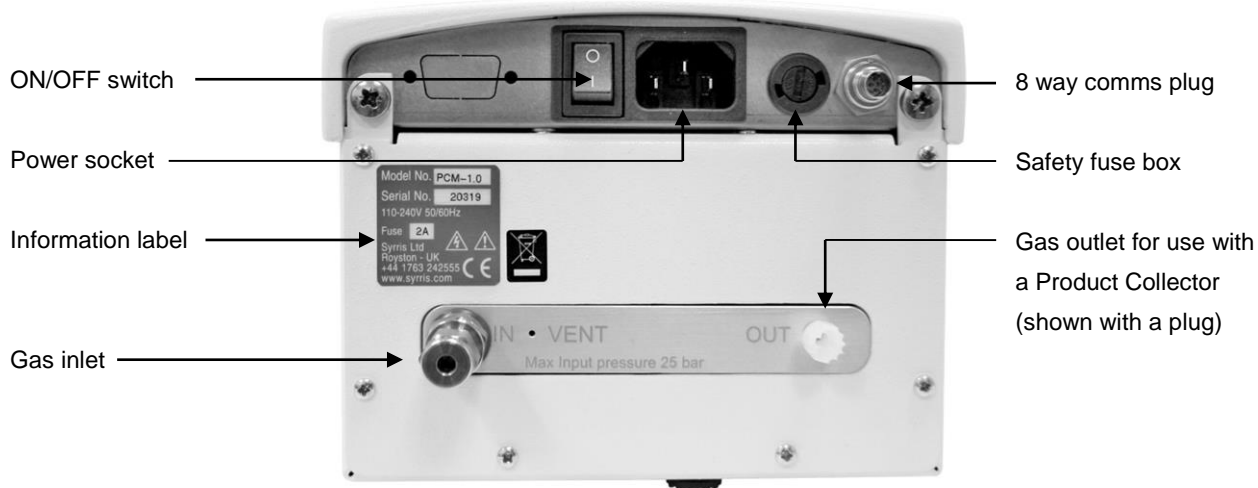


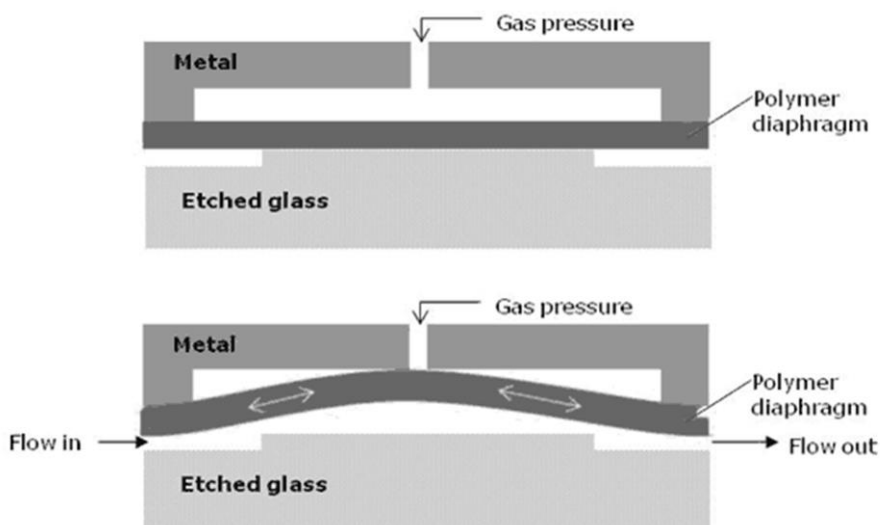
Figure 1



This image shows the rear of the Asia Pressure Controller.

Figure 2

3.1.1 Overview of the Back-Pressure Regulator



This image illustrates the internals of the Back-Pressure Regulator.

Figure 3

The Asia Pressure Controller sets the fluid pressure of the system. The reaction stream flows in-line through the Back Pressure Regulator (BPR).

When a gas pressure is supplied to the BPR diaphragm (defined by the user on the front panel of the Asia Pressure Controller and automatically controlled by the module), the upstream fluid flow must equal or exceed the

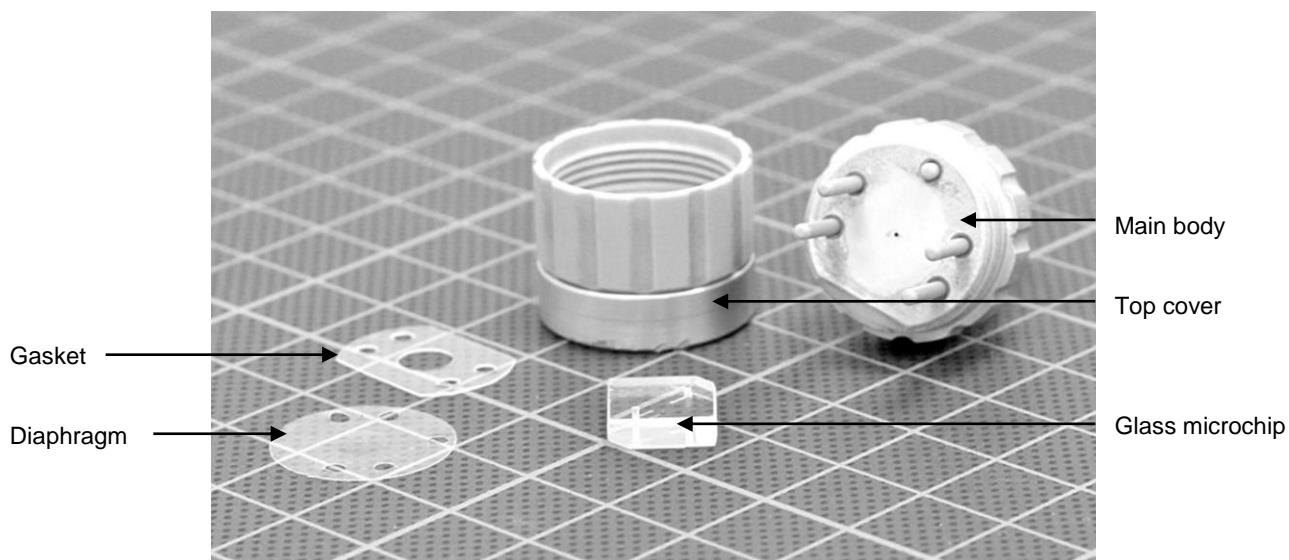
gas pressure in order to flow. When the Asia Syringe Pump is pumping, as liquids are negligibly compressible, the liquid pressure upstream of the BPR quickly rises to match the gas pressure applied to the other side of the diaphragm..



NOTE: The Pressure Controller will only work once the system is pumping. It needs fluid flowing through in order to pressurize the flow chemistry system.



NOTE: The pressure upstream of the Pressure Controller is often greater than setup pressure as a result of additional dynamic pressure due to flow.



This picture shows a dismantled Back Pressure Regulator (BPR)

Figure 4



NOTE: See the back of the manual for a list of parts for the Pressure Controller

3.2 Pressure Controller Specifications

Supply gas pressure requirement	2 – 25 bar
Input pressure fitting	1/8 female BSP on module. 1/8 male to BSP to 4mm high pressure polymer tubing (fittings and tubing supplied)
Set output pressure	1 – 20 bar (achievable pressure can only be \leq input pressure)
Pressure sensor readability	Displayed to 0.1 bar
Wetted materials	Glass and PFA
Outer materials	Aluminium, Stainless Steel & Polyurethane (sprayed white with highly chemically resistant epoxy paint)
Dimensions	(H) 135mm x (W) 160mm x (D) 260mm
Display	50mm x 16mm LED display with status indicator LEDs
Voltage input	100V to 240V AC, 50/60Hz
Current rating	0.6A
BPR channels internal volume	-

3.2.1 Enhanced Specification (With Upgrades)

Modes of operation	PC control via Asia Manager PC software
---------------------------	---

4 Quick Start Guide

1. Connect the Pressure Controller to an electricity source and switch on (Please see Section 5.1.1).
2. Connect an external gas supply (up to 25 bar) to the fluidic system. (See Section 5.1.2).
3. Tare the internal pressure sensor to make sure that pressure measurement is accurate (See Section 5.1.3) (Figure 5).
4. Locate the BPR in the correct location
 - a. For use without an Asia Product Collector, or Asia Automated Product Collector locate the BPR in the Pressure Control Module (as shown in Figure 6)
 - b. For use with an Asia Product Collector, or Asia Automated Product Collector:
 - i. Locate the BPR in the Asia Product Collector, or Asia Automated Product Collector (see the user manual for that module)
 - ii. Connect the gas supply from the back of the pressure controller (labelled “Gas Outlet for use with a Product Collector”, see Figure 7) to the Asia Product Collector, or Asia Automated Product Collector
5. Connect the liquid input and output to the BPR (these pipes and fittings will be labelled if an Asia Pipe Kit is supplied - Figure 8) (See Section 5.1.4) .
 - a. Connect the output of the reactor to one of the fittings on the BPR
 - b. Connect the other fitting of the BPR to the output of the flow system (or collection valve if using a Product Collector or Automated Collector)
6. When ready to begin the experiment, enter the desired pressure on the Pressure Controller. To do this:
 - a. Press the control knob (the “Set” LED should light)
 - b. Turn the control knob until the desired minimum reaction pressure is displayed (in Bar) (Figure 9)
 - c. Pressing the control knob again to validate the entry (See Section 5.2.2).



Figure 5



Figure 6

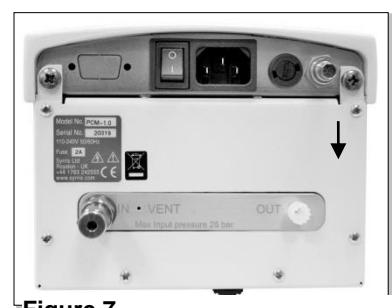


Figure 7



Figure 8



Figure 9

5 Using the Asia Pressure Controller

5.1 Setup

5.1.1 Connecting the main power lead

1. Plug the power lead into the 3-pin power socket at the back of the Pressure Controller module.
2. Press the ON/OFF switch at the back of the module.
3. The LED display will light up.
4. The Pressure Controller is ready to connect the external gas supply.



NOTICE: The module requires a stable 100V to 240V AC 50/60Hz power source.

5.1.2 Connecting the external gas supply to the module

Connections to the gas supply 4mm OD tube is made through a three-part connector (Figure 10).



Figure 10

To connect the gas supply to the Asia Pressure Controller module:

1. In the following order, put the nut, the ferrule and the fitting on the 4mm OD input tube (Figure 11).
2. Screw the fitting onto the gas inlet at the back of the module.
3. Use an 11mm spanner key to tighten the connection.
4. Open the external gas source and ensure it supplies up to 25 bar of clean, filtered, compressed gas.

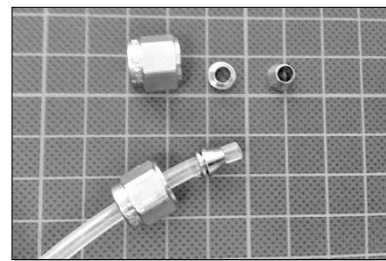


Figure 11



NOTICE: The module requires a stable 2 to 25 bar gas supply.



NOTICE: It is recommended to use an inert gas supply (nitrogen, argon etc.) or compressed air.



NOTE: The external gas supply will not be in contact with the reaction solution.



NOTE: The highest deliverable output pressure on the Pressure Controller is limited by the gas source pressure. Example: if the gas source supplies 12 bar pressure, the Asia Pressure Controller will only allow a 1 – 12 bar pressure range.

5.1.3 Taring the internal pressure sensor

1. Turn the Pressure Controller OFF using the ON/OFF switch at the back of the module.
2. Push the control knob and keep it pushed in (Figure 12). Next press the ON/OFF switch at the back of the module to switch it ON.
3. Wait for a few seconds until 'tare' displays on the front display (Figure 13).
4. Release the control knob.
5. The Pressure Controller is now tared, and will display a 0.0 bar pressure.



Figure 12



Figure 13



NOTE: Taring the internal pressure sensor needs to be repeated regularly, especially if the module has not been used for a while, in order to ensure accurate pressure measurement.

5.1.4 Connecting the fluidic lines to the Pressure Controller

The Pressure Controller should be placed towards the end of a fluidic set-up, just before the product collection. It is usually connected to a microfluidic reactor and to a collection module. The connections to the Pressure Controller are made through two different fittings (Figure 14).

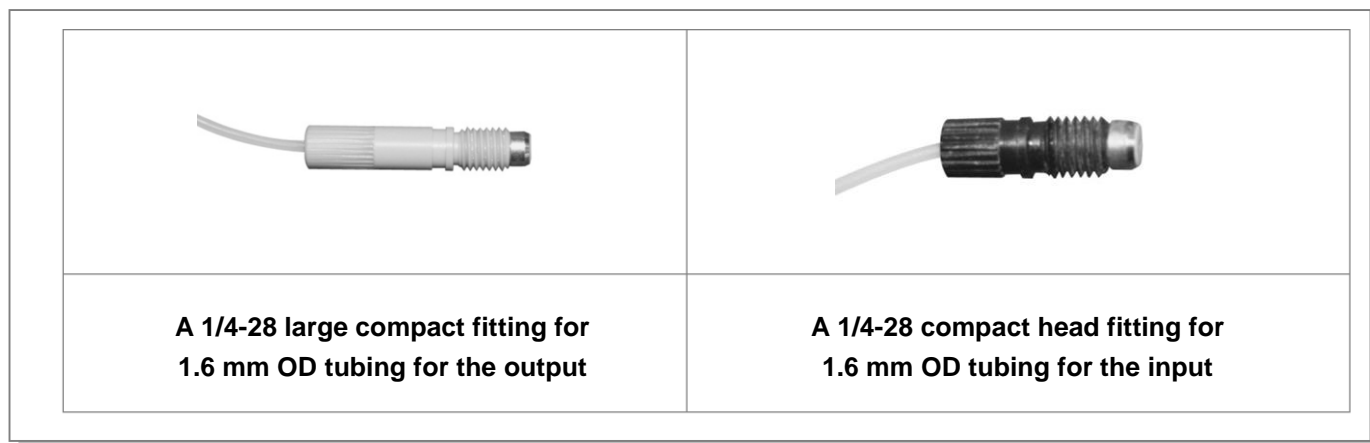


Figure 14



NOTE: Syrris Asia systems are supplied with pre-made tubing and fittings for attaching the Pressure Controller to a Syrris Microreactor. If you wish to make your own tubing, please use the appropriate fittings (see Figure 14) and follow the instructions found in Appendix 1 – Gripper Fitting Instructions.



NOTE: The connection to the microfluidic reactor will depend on the setup of the system.

Connections

The fluidic lines are connected as follows:

1. Remove the back-pressure regulator from the Pressure Controller module by pushing back the ring of the 'push-fit' fitting while holding the back-pressure regulator (Figure 15) (See section 6.2 for more details.)



Figure 15



NOTICE: All fittings should be tightened by hand. Do not use tools such as grippers, pliers or others as this will damage the glass chip of the back-pressure regulator.

2. Connect the shorter black fitting first by screwing it in one of the ports of the back-pressure regulator. This should be finger tight. (Figure 16).
Note that the direction of flow through the BPR is not important.
3. Connect the longer beige fitting next by screwing it the other port of the back pressure regulator. (Figure 17)



Figure 16



Figure 17



NOTE: The back pressure regulator (BPR) works regardless of the direction of flow. Input and output are interchangeable.



NOTE: The quality of the sealing and therefore of the pressure control, directly depends on the tightness of the fittings. Make sure both fittings are firmly screwed in.

5.2 Module Controls

5.2.1 Pressure display

The two LEDs to the left of the display identify which pressure (set or actual) is currently shown on the front display. Figure 18 indicates the different states.

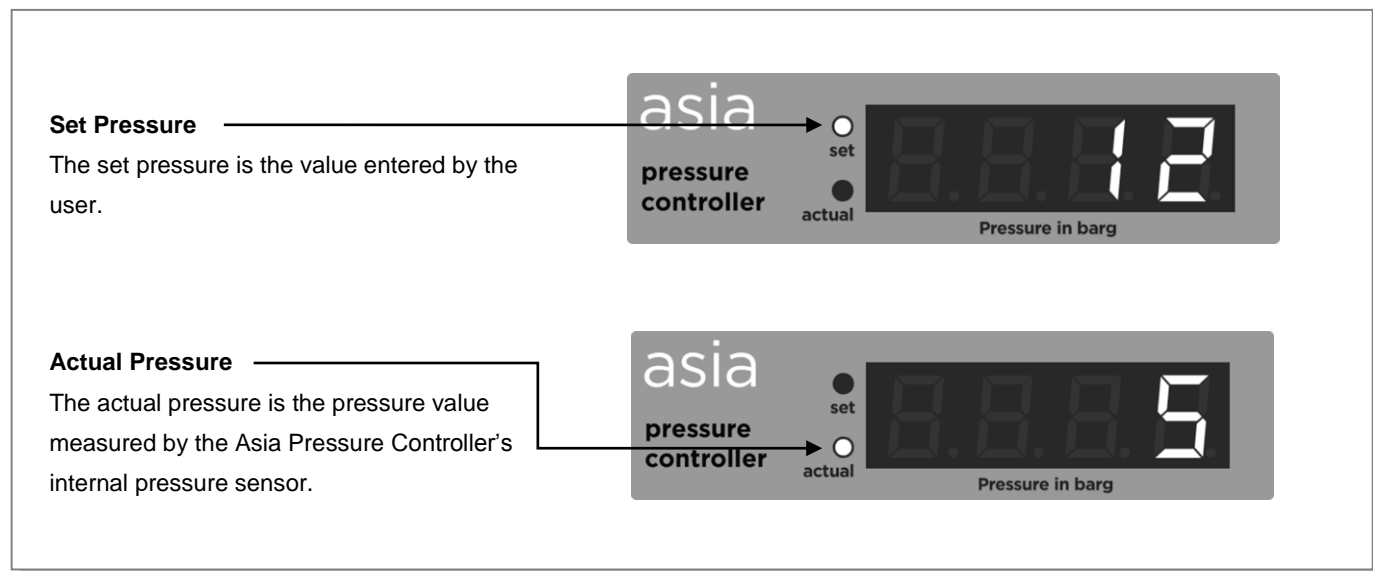


Figure 18

The actual pressure is zero referenced against ambient air pressure.
Example: a value of 0.0 bar means that the pressure is equal to ambient air pressure, a value of 2.0 bar means that the pressure is 2 bar higher than ambient pressure (i.e. 2 barg).

By default, when it is switched on, the Asia Pressure Controller displays the actual pressure, as indicated by the “actual pressure” indication LED.

Turn the control knob and the front display will show the set pressure for 3 seconds then revert back to display the actual pressure. The indication LEDs will switch on and off accordingly.



NOTE: Actual pressure is displayed to 1 decimal (e.g. 5.0). Set pressure is displayed to 0 decimals (e.g. 5).

5.2.2 Setting the pressure

To set the pressure:

1. Push the control knob once to display the set pressure (the 'set' indication LED will be on) (Figure 19).
2. Turn the control knob to dial the set pressure value: turn the knob clockwise to increase the value and anti-clockwise to decrease it.
3. Push the control knob to validate the entered pressure value (Figure 20).
4. After validation, the Pressure Controller will increase or decrease the actual pressure to reach the defined value.



Figure 19



Figure 20

5.2.3 Switching the pressure off

To switch the pressure off:

1. Push the control knob once to display the set pressure (the 'set' indication LED will be on) (Figure 21)
2. Turn the control knob anti-clockwise until 'OFF' appears on the front display (Figure 22).
3. Push the control knob to validate.
4. After validation, the Pressure Controller will vent until the system pressure reaches the room pressure. The display screen will then show a pressure between 0 and 1 bar.



Figure 21



Figure 22

6 Maintenance

6.1 Cleaning the system

To ensure a good working condition of the Asia Pressure Controller, please clean after use.

6.1.1 Flushing the back-pressure regulator

After each experimental run, flush the back pressure regulator (BPR) by pumping clean solvent through it for 1 minute.



NOTICE: Never leave reagent solution in the back pressure regulator (BPR) after an experiment.

6.1.2 Cleaning external surfaces

Any spillage on the external surfaces of the Asia Pressure Controller needs to be quickly cleaned using a damp cloth (water or isopropanol may be used).

6.1.3 Cleaning the BPR chip and cleaning and replacing the diaphragm

The chip and diaphragm of the back pressure regulator should be inspected regularly.

After use, particulates can build up in the BPR chip etched channels. This can cause the BPR to allow flow through when not intended, this lowering the performance of the BPR, especially at low flow rates.

The diaphragm can get worn/damaged and will need to be replaced from time to time, dependant on the frequency of use and the nature of the solution pumped through the back pressure regulator.

To clean/service the BPR chip and diaphragm:

1. Remove the back pressure regulator (see Section 6.2)
2. Disassemble the back pressure regulator (see Section 6.3 'Disassembling the back pressure regulator (BPR)') and inspect the diaphragm.
3. Ensure the surfaces of the BPR diaphragm are clean and the diaphragm is not damaged or creased

4. Replace the diaphragm with a new one if necessary and re-assemble the BPR (see Section 6.4 'Re-assembling the back pressure regulator (BPR)').
5. Ensure the surfaces of the BPR chip are clean, especially in the two etched channels that extend along one face of the chip between the two through holes.
 - Clean with water, then acetone
 - Physically dislodging solids can also be useful e.g. with a small plastic scrubbing brush or the pointed corner of a folded paper towel
6. Re-assemble the BPR (see Section 6.4 'Re-assembling the back pressure regulator (BPR)').

6.2 Removing the back pressure regulator

Before removing the back pressure regulator (BPR) make sure the BPR pressure is set to 0 bar. To remove the back pressure regulator from the Pressure Controller:

1. For ease, remove the drip tray from the module (Figure 24).
2. While holding the back pressure regulator in one hand, push back the ring of the 'push-fit' fitting with the other (Figure 25).
3. The back pressure regulator should spring release (Figure 26).
4. It is removed and ready to be disassembled (see Section 6.3).



Figure 23



Figure 24



Figure 25



Figure 26

6.3 Disassembling the back pressure regulator (BPR)

To disassemble the back pressure regulator:

1. Unscrew the top cover. The two knurled sections twist apart from each other but the top remains static (Figure 27).

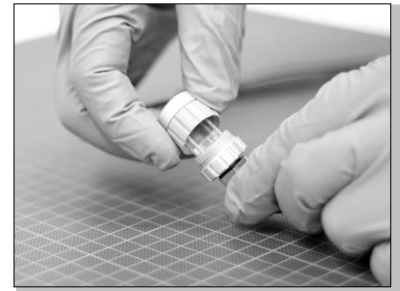


Figure 27



NOTICE: Do not grip the top of the BPR (the smooth section with BPR letters engraved) when unscrewing the BPR. This section does not twist. Attempting to twist this section may damage the BPR.

2. Carefully remove the glass microchip (Figure 28).
3. Remove the diaphragm and gasket using a pair of tweezers to hold the edge of the diaphragm (Figure 29).

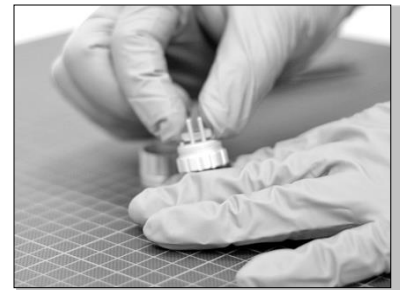


Figure 28



Figure 29



NOTICE: It is possible to damage the diaphragm by gripping it with tweezers in the middle (where it contacts the BPR chip).

4. The back-pressure regulator is now fully disassembled (Figure 30).

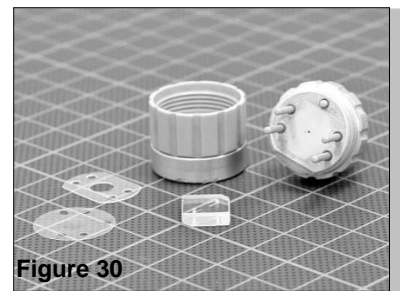


Figure 30

6.4 Re-assembling the back pressure regulator (BPR)

The BPR chip and diaphragm should be cleaned with solvent before re-assembly. Replace the diaphragm with a new one if necessary. The BPR gasket should normally not require cleaning, as it does not come into direct contact with solvents or reagents.

1. Put the gasket back on the main body of the back-pressure regulator (Figure 31).
2. Carefully put the diaphragm on top of the gasket. This has a special hole in it to allow it to line up with the pin in the base section. Ensure the diaphragm is aligned correctly to allow the hole in the diaphragm to pass over the pin (Figure 32).
3. Place the glass microchip on top of the diaphragm. Make sure the wedge section of the microchip sits over the pin as shown on the picture (Figure 35).
4. Place the top cover of the back-pressure regulator onto the base section and tighten only by hand (Figure 34).
5. The back-pressure regulator is now assembled (Figure 33).

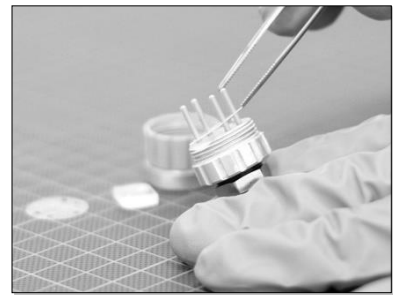


Figure 31



Figure 32

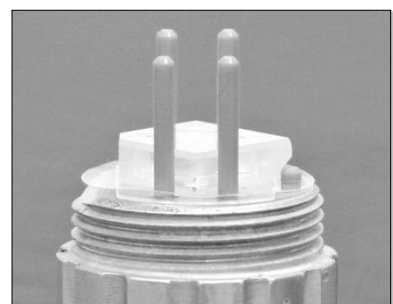


Figure 35

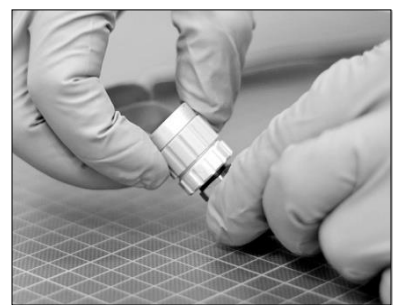


Figure 34



Figure 33

6.5 Disconnecting the main power lead

1. Press the ON/OFF switch at the back of the module.
2. Disconnect the power lead from the 3-pin power socket at the back of the Pressure Controller module. See figure 2, section 3.1 for the location of the power socket.

6.6 Changing the fuse

1. Use a flat head screw driver, gently unscrew the fuse box (Figure 36) using a flat-head screwdriver
2. Pull the fuse box out (Figure 37).
3. Replace the fuse by a new F 2A L 250V fuse (Figure 38) as stated on the label plate on the rear of the module.
4. Screw the fuse box back into the module (Figure 39).



Figure 36



Figure 37



Figure 38



Figure 39

6.7 Displaying the firmware version

The firmware version is obtained by keeping the control knob pushed for several seconds while the Pressure Controller module is switched on.

The front screen displays the firmware version in a XX.XX format. For example, the module shown in Figure 40 has firmware version 01.01 installed.



Figure 40



The front screen displays the firmware version in a XX.XX format.

Figure 41

7 Support

The device warranty becomes void if any modification is carried out without Syrris consent. Only personnel trained by Syrris may carry out modifications, repairs or maintenance work.

For any queries regarding the Asia Pressure Controller please contact support@syrris.com.

8 Appendix

8.1 List of parts

The following is a list of Syrris parts, spares and consumables for the Asia Pressure Controller:

Name	Part No.
Asia Pressure Controller	2200532
Back Pressure Regulator (BPR)	2110706
BPR chip	2100737
BPR Diaphragm Set (2 pairs of gasket and membrane)	2100896
Large compact fitting for 1.6mm OD pipe (Pack of 2)	2200105
Compact Head Fitting for 1.6mm OD Pipe (Pack of 10)	2200103
PTFE Pipe Gripper for 1.6mm OD Pipe (Pack of 10)	2200102

8.2 Gripper Fitting Instructions

Gripper fittings are a flangeless tube connection system, which incorporate a PTFE seal housed in a 316 Stainless Steel case. To fit them on a 1.6mm OD tubing:

1. With a scalpel, cut the tubing to form a point approximately 30mm long. This enables the tube to be passed through the gripper. (Figure 42)
2. Fit tube end fitting to tube. Then fit a gripper to the tube ensuring the PTFE seal is facing towards the pointed tube end. (Figure 43)
3. With the aid of pliers or similar, grip the pointed tube end and pull through the gripper until the PTFE seal has reached the uncut section of the tube. Keeping the gripper as perpendicular as possible to the tube will ensure the best performance. (Figure 44)
4. Rotate the gripper around the tube 3 or 4 times to seat the gripper on the tube correctly.
5. Using a scalpel, cut the pointed tube end as close to the PTFE face as possible (Figure 45).

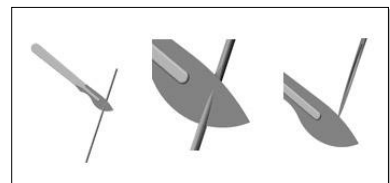


Figure 42

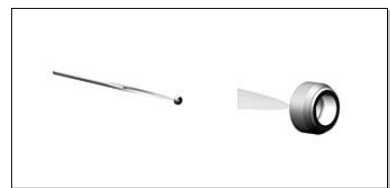


Figure 43



Figure 44

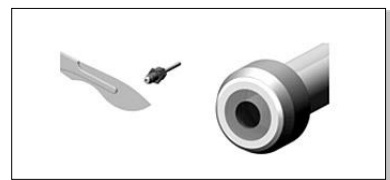


Figure 45



NOTICE: Always make tube cuts away from body and keep fingers away from blade.



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Syrris Ltd. is a member of the Blacktrace Group

8.3 EC Declaration of Conformity

We Syrris Ltd
of 27 Jarman Way, Royston, Herts, SG8 5HW

in accordance with the following Directive(s):

2004/108/EC	The Electromagnetic Compatibility Directive
2006/42/EC	The Machinery Directive

hereby declare that: Equipment: Asia flow chemistry system consisting of:

Part Number	Description
2200292	Asia Pump
2200400	Asia Pressurized Input Store
2200520	Asia Reagent Injector with 5ml Sample Loops
2200526	Asia Chip Climate Controller
2200563	Asia Reagent Injector with no Sample Loops
2200532	Asia Pressure Controller
2200527	Asia Heater
2200531	Asia Flex
2200533	Asia SAD
2200534	Asia Product Collector
2200536	Asia Automator
2200710	Asia Tube Cooler
2200720	Asia Cryo Controller

and associated accessories are in conformity with the applicable requirements of the following documents:

Ref. No.	Title	Edition/date
EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction	2010
EN 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements	2010
EN 61326-1	Electrical equipment for measurement, control and laboratory use. EMC requirements	2013

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable essential requirements of the Directives.

Signed by:

Name: Andrew Lovatt

Position: CTO



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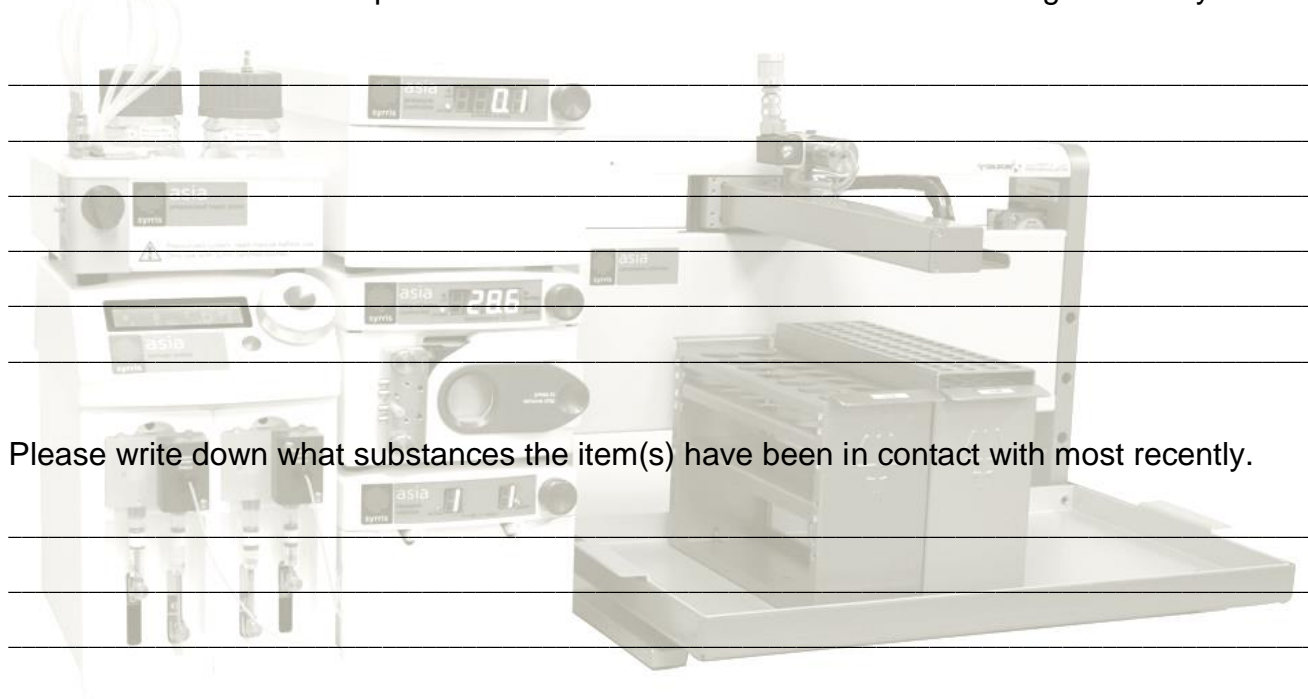
Done at Syrris Ltd
27 Jarman Way, Royston, Herts, SG85HW, UK
27/04/2015

8.4 Certificate of Decontamination

This document must be completed in full and signed by the Customer (a) before transporting, by any means, a product to Syrris for repair or service, and (b) prior to any on-site service to be performed by Syrris Ltd.

A completed copy of this Certificate is required to be attached to the instrument / part itself AND to the outside of the packing container when transporting to Syrris Ltd or Syrris Inc.

- Please ensure all wetted parts have been thoroughly washed with methanol, ethanol, Isopropyl alcohol (IPA) or acetone.
- Please ensure any glassware has been thoroughly washed with methanol, ethanol, Isopropyl alcohol (IPA) or acetone.
- Please ensure any items that are being sent to Syrris is suitably packaged and well protected.
- Please write a brief description for the reason of this/these items are being sent to Syrris.



- Please write down what substances the item(s) have been in contact with most recently.

Sign Name	
Print Name	
Date	

Company Name	
Address 1	
Address 2	
Address 3	
Town/City	
Post Code	
Country	

For the quickest response for all technical enquiries please email
support@syrris.com

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